Nonequilibrium Detonation of Composite Explosives

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The effect of nonequilibrium diffusional flow on detonation velocities in composite explosives is examined. Detonation conditions are derived for complete equilibrium, temperature and pressure equilibrium, and two forms of pressure equilibrium. Partial equilibria are associated with systems which have not had sufficient time for transport to smooth out the gradients between spatially separate regions. The nonequilibrium detonation conditions are implemented in the CHEQ equation of state code. We show that the detonation velocity can decrease as the non-chemical degrees of freedom of the explosive are allowed to equilibrate. The detonation velocity can increase when the chemical degrees of freedom are allowed to equilibrate.

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